



AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
DESIGN AND PRODUCTION ENGINEERING
DEPARTMENT

Utilization of recycled tire composites in engineering products

A thesis Submitted in partial fulfillment of the
requirement of the Degree of Master of Science in
Mechanical Engineering

By **Kareem Fathy Mohamed Abo El-Enin**

B.Sc. in Mechanical Engineering, 2012

Supervised by

Prof. Dr. M. Hazem Abd EL-Latif

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Cairo - 2016



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FACULTY OF ENGINEERING

Design and Production Engineering

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Design and Production Engineering Department

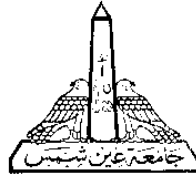
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STATEMENT

This thesis is submitted in partial fulfillment of Master of Science degree in mechanical engineering, Faculty of Engineering, Ain Shams University.

The author carried out the work included in this thesis, and no part of this thesis has been submitted for a degree or qualification at any other scientific entity.

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SUMMARY

The objective of this research is the utilization of waste tire rubber to get novel polypropylene composite materials of satisfactory properties to suit various applications.

Treatment of waste tire rubber particles is done by H_2SO_4 to enhance the adhesion at the interface between the waste tire rubber particles and the PP matrix that affects the properties of resulted composites.

Optimum composition of the composite is selected by studying various rubber particles weight percentage 5%, 10%, 20%, 30%, 40% and 50% and by using different rubber particle sizes.

The physical properties such as water absorption and mechanical properties such as bending strength, elastic modulus, compressive yield strength, hardness and impact strength are studied for the PP-waste tire rubber particles composites and the optimum composition of the composite is selected to suit certain engineering application. Also, dimensional stability of composite of the highest impact strength is studied.

Investigation of the fracture surface of the specimen is done using SEM to evaluate the interface between rubber particles and polypropylene.

Keywords: Recycling of tires, waste tire rubber particles, Polypropylene, Composite, Mechanical properties for composites.

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List of abbreviations

E	Young's modulus or elastic modulus.
GTR	Ground tire rubber
CPR	Composite of PP and GTR
PP	Polypropylene.
TMA	Thermo mechanical analysis
DSC	Differential scanning calorimetry
FTIR	Fourier transformation
Wt.%	Weight percent
CTE	Coefficient of thermal expansion
TDF	Tire derived fuel
U CPR	Untreated GTR-PP composite
T CPR	Treated GTR-PP composite

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